MASTER OF SCIENCE
IN
METEOROLOGY

AEROSOL OPTICAL DEPTH ANALYSIS WITH NOAA GOES AND POES IN THE WESTERN ATLANTIC

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An aerosol optical depth retrieval algorithm in the visible wavelengths for the NOAA POES AVHRR and GOES-8 visible imager is presented for the cloud free, marine atmosphere. The algorithm combines linearized single-scatter theory with an estimate of surface reflectance. Phase functions are parameterized using an aerosol size distribution model and the ratio of radiance values measured in channels 1 and 2 of the AVHRR. Retrieved satellite aerosol optical depth (AOD) is compared to three land-based sun photometer stations located on islands in the western Atlantic during July and September, 2001. GOES-8 channel 1 (visible wavelength) radiance values were initially calibrated using techniques developed by Rao. Additional corrections to the channel 1 GOES-8 radiances were made by applying a linear offset factor obtained during the experimental time period through comparison with AVHRR radiances. The results for the GOES-derived AOD compare favorably to the AERONET-measured AOD values. For both NOAA and GOES data, the comparison dataset has a correlation coefficient of 0.67 with a standard error of 0.07. For higher AOD cases (d = 0.25), the general trend was for the satellite-derived AOD values to underestimate AERONET-observed conditions. During these higher conditions, the scattering phase function pattern contained within the algorithm deviated from the expected pattern, especially between 140^o – 180^o. Overall, the more accurate calculations of AOD occurred over scatter angles between 140^o - 150^o and 170^o – 180^o.

KEYWORDS: Radiative Transfer, NOAA AVHRR, POES, GOES, Aerosol Optical Depth, AOD, Dust, Caribbean Sea